ILLINOIS INSTITUTE OF TECHNOLOGY

IPRO 323:

Laser and Waterjet Technology

Website:
http://www.iit.edu/~ipro323s06

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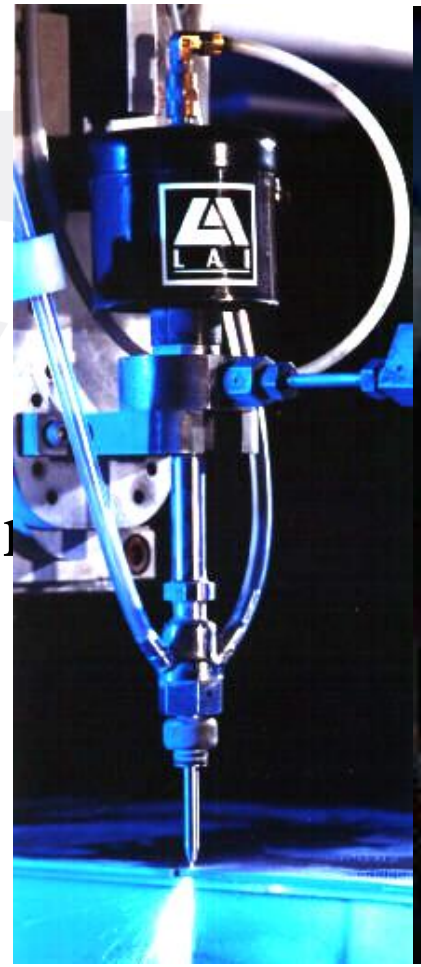
Presentation Outline

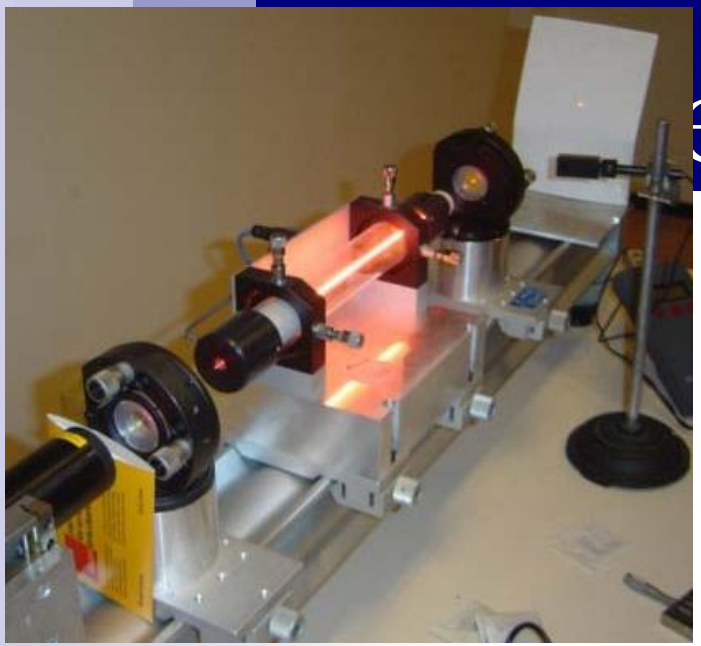
- Introduction
- IPRO Objectives
- Laser Overview
- Waterjet Overview
- Technology Comparison
- Market Trends
- Conclusions & Recommendations



Objectives

- Gather information regarding the detailed specifications of how lasers and waterjets work.
- Examine the applications that lasers and waterjets can have in a variety of manufacturing processes.
- Compare which machinery is better suited for a particular task.
- Determine the feasibility of introducing these machines to a mainstream industrial market.

Lasers: An Overview



Laser Technology Overview

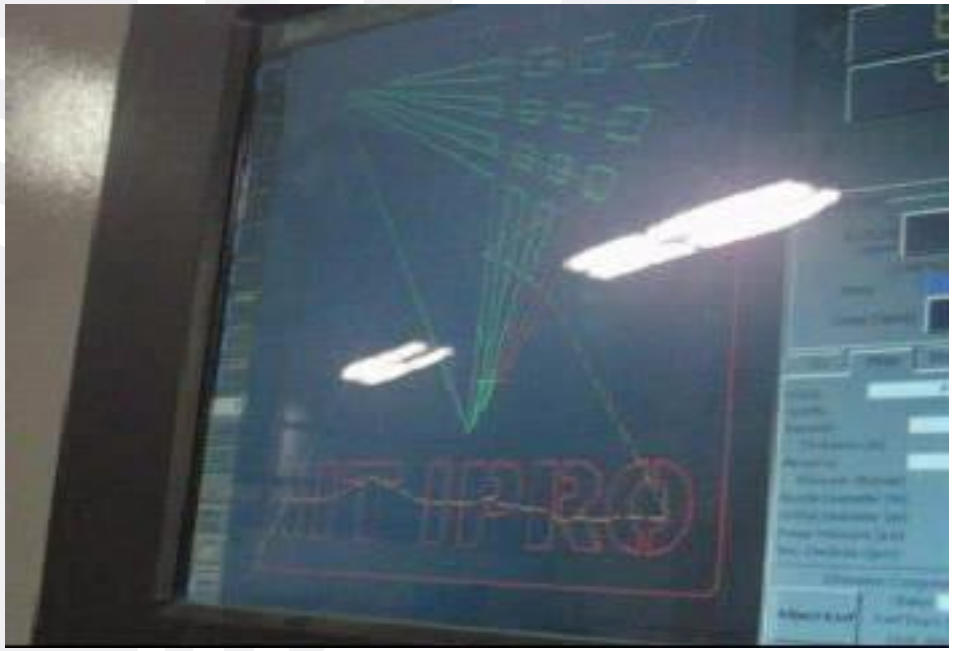
- What is a laser?
  - **L**ight **A**mplification by **S**timulated **E**mission of **R**adiation.
  - Excited Electrons Creating Light
  - YAG vs. CO_2
- Laser Properties
  - Monochromatic
  - Highly Directional
  - High Power in a Small Area

Laser Technology Overview

- Laser Uses
  - Cut very hard materials
  - Alternative to metal stamping
  - Rapid prototyping

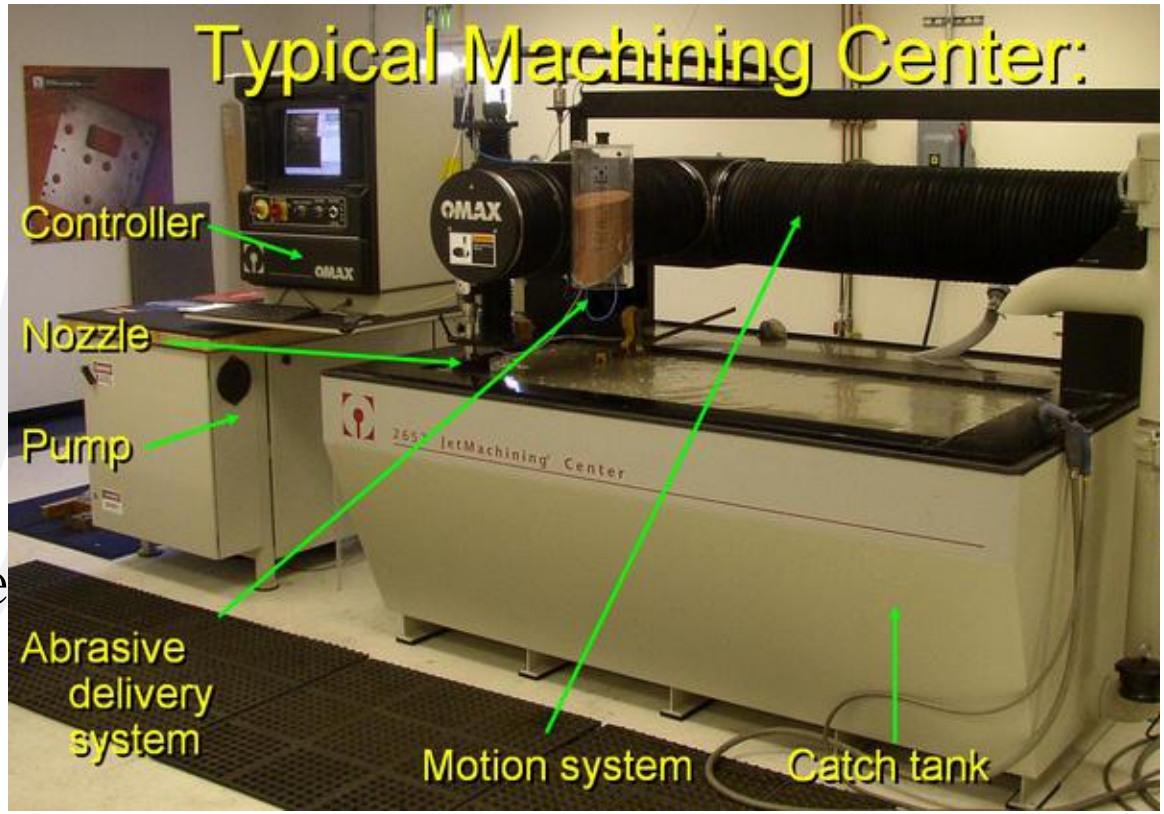
Waterjets: An Overview

Waterjet Demonstration



Waterjet Technology Overview

- Major Components
  - Pump
  - Plumbing
  - Cutting Head
- Types
  - Abrasive
  - Non-Abrasive

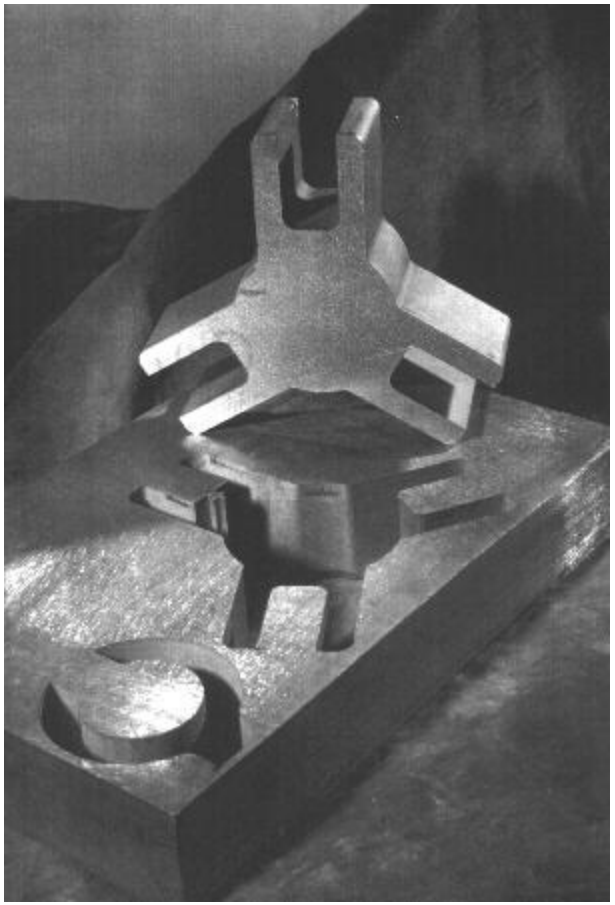


Waterjet Technology Overview

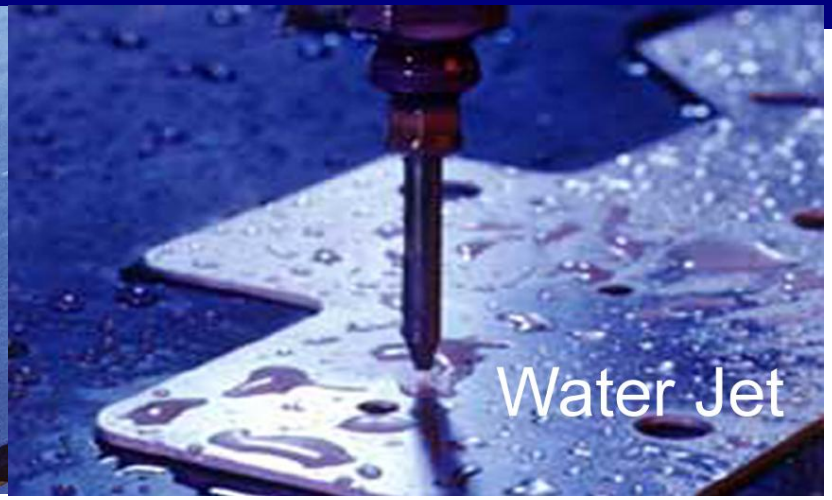
- Pure Waterjet Attributes
  - Very thin stream (0.004 to 0.01 in. Diameter)
  - Able to cut soft, light materials
  - Extremely low cutting forces
- Abrasive Waterjet Attributes
  - Thin stream (0.02 to 0.05 in. Diameter)
  - Thin and thick material cutting (up to 10 in.)
  - Low cutting forces

Waterjet Technology Overview

- Why Use Waterjets?
  - Very Powerful
  - “Cold” Cut Process
  - Minimal wear on machine
- Who Uses Waterjets?
  - Food Industry
  - Aerospace Industry
  - Smaller Custom Shops
  - Automotive



Laser and Waterjets: A Comparison



Laser and Waterjet Comparison

Laser advantages

- Narrow cutting tolerance (.020 inches)
- Low maintenance
- Faster cutting rates

Laser disadvantages

- Equipment cost
- Material limitations
- Small Heat Affected Zone

Waterjet advantages

- Cuts all materials
- No Heat Affected Zone
- No part distortion

Waterjet disadvantages

- Equipment cost
- Pump maintenance (every 1,000 hours)
- Noise (80 dB or more)
- Slow cutting rates
- Water must be highly purified

Market Trends

Market Trends

- Misconceptions
  - Lasers and waterjets are brand new technologies
  - These machines are high maintenance
  - Not cost effective to operate
- Truths
  - Lasers and waterjets are well established and reliable
  - Low maintenance and simple operation
  - Initial purchase saves future production costs

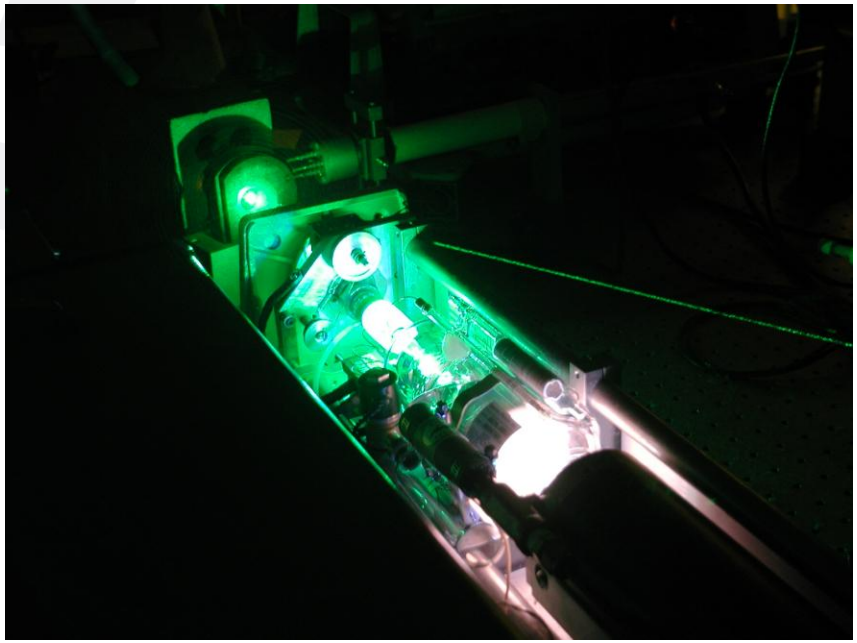
Market Trends

- Industry Growth
  - Lasers
    - $1.5 **billion** sales per year
    - 22% growth between 2003-2004
    - 3-4% growth expected this year
  - Waterjets
    - Fastest growing in machine tool market
    - 9.1% steady growth rate between 1997-2004
    - Expected increase in sales

Conclusions and Further Study

Conclusions

- Both technologies provide alternatives to traditional cutting methods
- Cost effective investment
- Both machines are reliable for general applications



Recommendations

- Large companies consider long term investment in these machines
- Small companies develop rapid prototyping for limited production
- Future IPROs can select industries that would benefit and propose machine alternatives

Questions?

For more information check out
http://www.iit.edu/~ipro323s06

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